Electronic Supplementary Information for Dalton Transactions

Electronic Supplementary Information

Ultrathin $SmVO_4$ Nanosheets: Ionic Liquid–Assisted Hydrothermal Synthesis, Characterization, Formation Mechanism and Optical Property

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Table S1. Summary of the experimental parameters, morphology and phase composition of the corresponding products

Sample	reaction conditions				morphology	phase
	the amount of [BMIM]Br (mL)	pH	*T* (°C)	*t* (h)		
1	0	11	180	48	irregular nanoparticles and sheet-like crystals	*t*-$SmVO_4$
2	0.75	11	180	48	sheet-like crystals	*t*-$SmVO_4$
3	3.0	11	180	48	nanosheets	*t*-$SmVO_4$
4	6.0	11	180	48	mciroscale sheets and particles	*t*-$SmVO_4$
5	1.5	11	120	48	nanosheets	*t*-$SmVO_4$ and *h*-$Sm(OH)_3$
6	1.5	11	150	48	nanosheets	*t*-$SmVO_4$ and *h*-$Sm(OH)_3$
7	1.5	11	200	48	nanosheets	*t*-$SmVO_4$ and *h*-$Sm(OH)_3$
8	1.5	1	180	48	bulk particles	*t*-$SmVO_4$ and $VO_{0.53}$
9	1.5	5	180	48	bulk particles	*t*-$SmVO_4$ and $VO_{0.53}$
10	1.5	7	180	48	nanoparticles	*t*-$SmVO_4$ and *h*-Sm(OH)
11	1.5	9	180	48	nanosheets	*t*-$SmVO_4$
12	1.5	13	180	48	square-like microcrystals	*t*-$SmVO_4$ and *h*-Sm(OH)
13	1.5	11	180	1	nanoparticles	*h*-$Sm(OH)_3$
14	1.5	11	180	4	nanoparticles and nanosheets	*h*-$Sm(OH)_3$
15	1.5	11	180	8	nanosheets	*t*-$SmVO_4$ and *h*-$Sm(OH)_3$
16	1.5	11	180	12	nanosheets	*t*-$SmVO_4$ and *h*-$Sm(OH)_3$
17	1.5	11	180	16	nanosheets	*t*-$SmVO_4$ and *h*-$Sm(OH)_3$
18	1.5	11	180	32	nanosheets	*t*-$SmVO_4$ and *h*-$Sm(OH)_3$

Table S2. EDX determined elemental composition of the synthesized *t*-$SmVO_4$ nanosheets

Element	Weight %	Atomic %	Uncertainty %	Detector Correction	k-Factor	Absorption Correction
O(K)	25.794	69.305	0.409	0.495	2.059	0.921
V(K)	16.997	14.343	0.215	0.994	1.353	0.997
Sm(L)	57.208	16.351	0.552	0.807	4.380	0.997

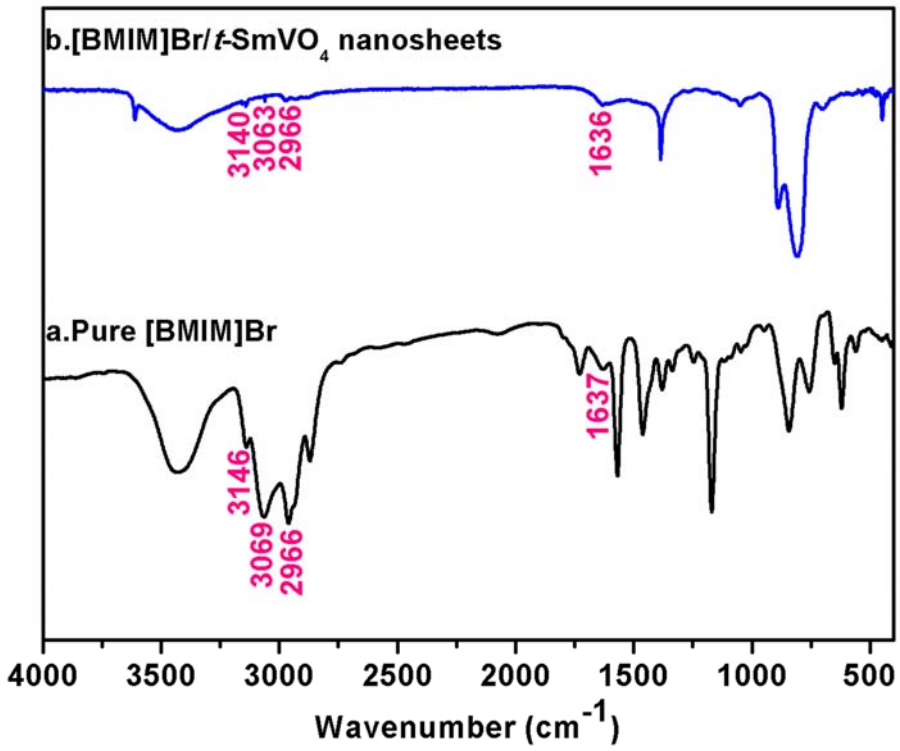

Figure S1. FT-IR spectra of pure [BMIM]Br (a) and [BMIM]Br/*t*-$SmVO_4$ nanosheets (b).

Table S3. FT-IR Absorption frequencies for Pure [BMIM]Br and [BMIM]Br/*t*-$SmVO_4$ nanosheets

frequencies of absorption bands (cm^{-1})		assignments
[BMIM]Br	[BMIM]Br/*t*-$SmVO_4$ nanosheets	
3146, 3069	3140, 3063	C(2)-H of imidazole ring stretching vibration
2966	2966	C-H bonds of alkyl chains stretching vibration
1637	1636	C=C stretching vibration of imidazole ring

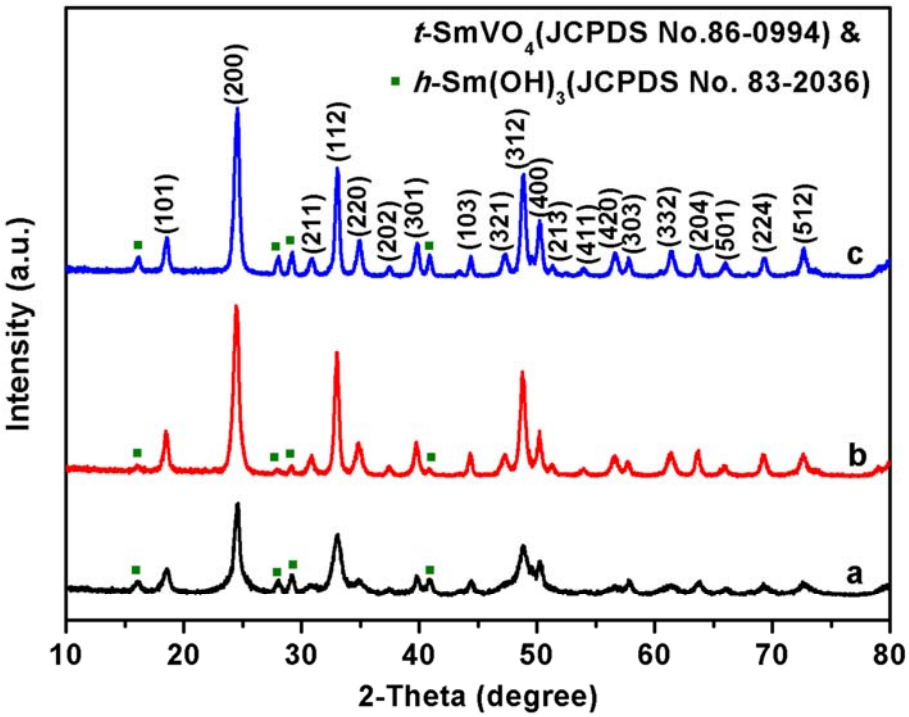

Figure S2. XRD patterns of the products prepared at different temperatures (48 h, 1.5 mL of [BMIM]Br (0.01 M), pH = 11): (a) 120 ˚C, (b) 150 ˚C, (c) 200 ˚C.

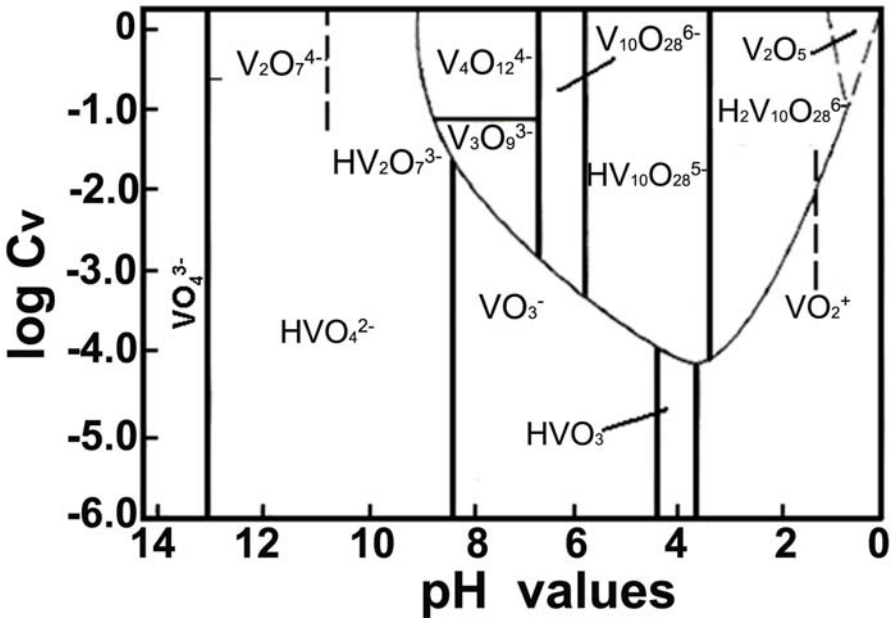

Figure S3. The relationships of V ions at various pH are given.[S1]

(S1) S. L. Yang, G. Q. Liu, and H. S. Chen, Vanadium and titanium materials, Metallurgical Industry Press, 2007, Chapter 3

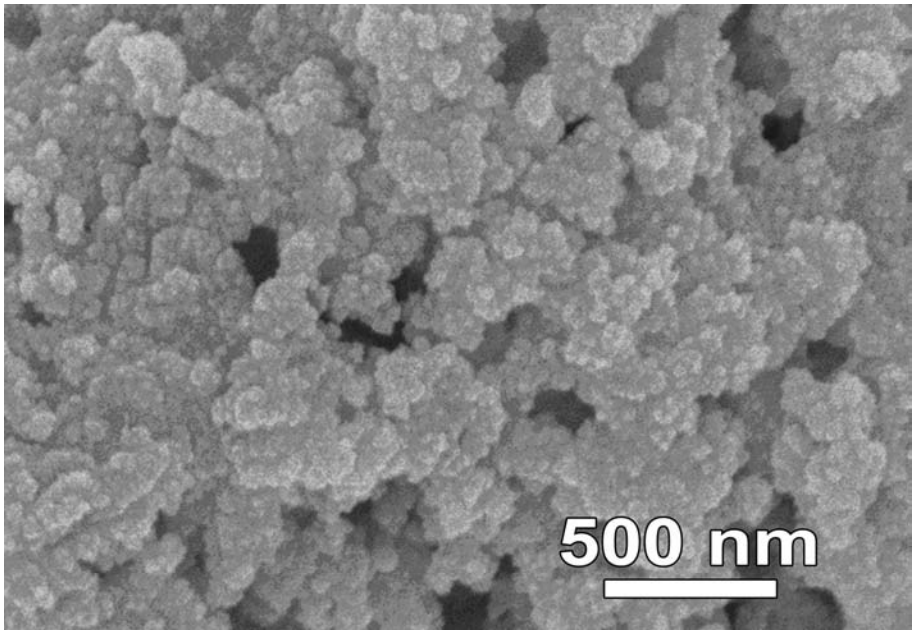

Figure S4. SEM image of the product obtained under pH = 5 at 180 °C for 48 h with 1.5 mL of [BMIM]Br (0.01 M) presented.

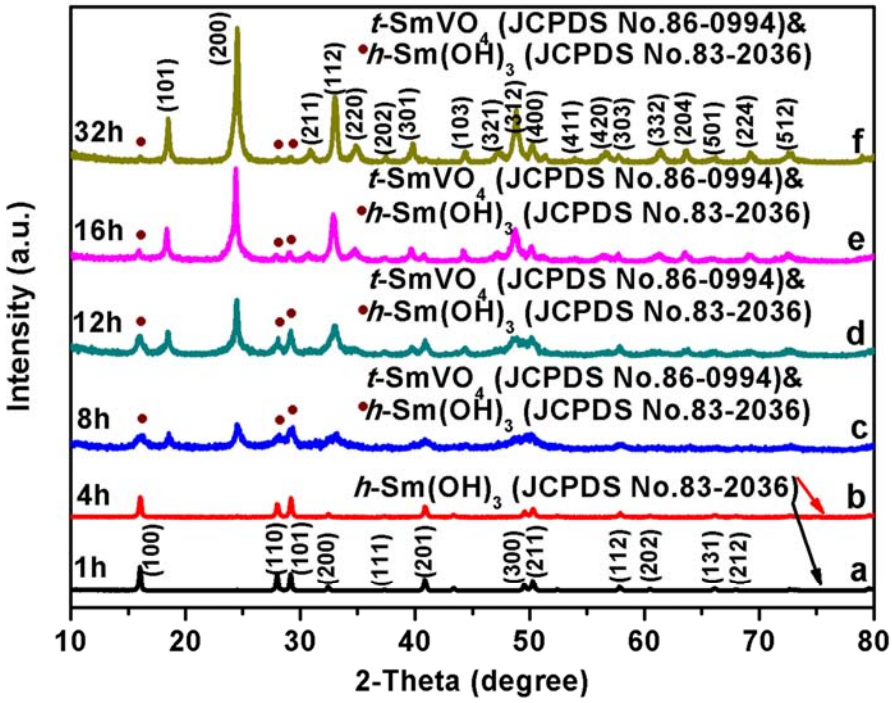

Figure S5. XRD patterns of the samples obtained at different reaction intervals using 1.5 mL of [BMIM]Br (0.01 M) at 180 ˚C and pH = 11: (a) 1 h; (c) 8 h; (d) 12h; (e)16 h; (f) 32 h.

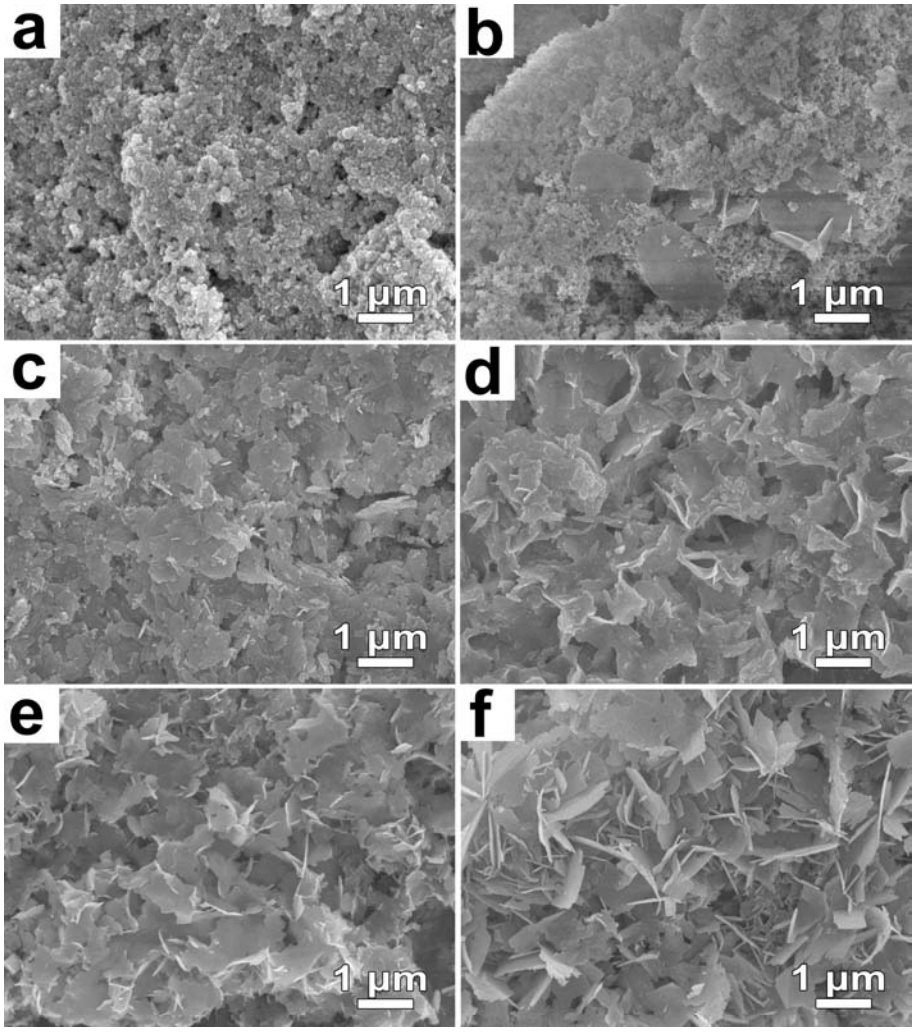

Figure S6. SEM images of the samples obtained under different reaction time using 1.5 mL of [BMIM]Br (0.01 M) at 180 °C and pH = 11: (a) 1 h, *h*-$Sm(OH)_3$ nanoparticles; (b) 4 h, *h*-$Sm(OH)_3$ nanoparticles and nanosheets; (c) 8 h, a mixture of *t*-$SmVO_4$ and *h*-$Sm(OH)_3$ nanosheets with the thickness of 40 nm; (d) 12 h, a mixture of *t*-$SmVO_4$ and *h*-$Sm(OH)_3$ nanosheets with the thickness of 30 nm; (e) 16 h, a mixture of *t*-$SmVO_4$ and *h*-$Sm(OH)_3$ nanosheets with the thickness of 25 nm; (f) 32 h, a mixture of *t*-$SmVO_4$ and *h*-$Sm(OH)_3$ nanosheets with the thickness of 20 nm.